INITIAL REVIEW ENGINEERING REPORT [redacted]
PMN: 18-0070

Final 5/31/2018
ENGINEER: El-Zoobi \ LMK \ JAS
PV (kg/yr): [redacted]
Revision Notes / Assessment Overview: =====> Revision 2: The assessment [redacted] was revised to account for information provided by CCD on 5/11/18. =====> Revision 1: Submitter provided information on 3/7/18 updating release [redacted] providing more information about processing and use steps, and discussing industry norms for waste treatment at processing and use sites. RAD incorporated this information and eliminated water releases for PROC and USE, and separated the end uses [redacted]

SUBMITTER: ArrowStar, LLC

USE: [redacted] for polyurethane [redacted]

OTHER USES: [redacted].

MSDS: Yes Label: No

Gen Eqpt: EYES AND FACE: Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). // SKIN: Wear nitrile gloves. // PROTECTIVE CLOTHING: Use clothing necessary to prevent contact.

Respirator: None normally required.
Health Effects: Causes eye irritation. Minimal skin irritation may occur with exposure to a large amount of material. Swallowing this product may cause gastrointestinal irritation, diarrhea, nausea and vomiting.

TLV/PEL:

CRSS :
Chemical Name: [redacted]

S-H20: 1000 g/L @
VP: 1.0E-6 torr @
MW: [redacted]
Physical State and Misc CRSS Info:
Neat: Liquid Mfg: Liquid Proc/Form: [redacted] End Use: [redacted]
by GPC. Submitted Properties: BP > 230 °C (Sub. Est.); WS = Partially soluble; Flash Point > 125 °C (Sub. Est.); Density = 1.222 g/cc; Hydroxyl Number = [redacted] mg KOH/g; Viscosity = 2200 cP; [redacted] (Sub. Est.). The MS and IR spectrum are included with the PMN submission. Estimated Properties: BP = 458 °C (EPI); VP = 4.5E-10 torr (EPI); WS = 1000 g/L (EPI); logP = -1.20 (EPI). The EPI estimations were performed for a component consisting of 1 equivalent each of [redacted] having a molecular weight of [redacted], and a SMILES structure of [redacted]

Consumer Use: No
SAT (concerns) (01/19/2018):
Related Cases and Misc SAT Info:
Analogs: [redacted]
Migration to groundwater: Slow
PBT rating: P3B1T2
Health: 2 Dermal, Drinking Water, Inhalation
Eco: 1 No releases to water

OCCUPATIONAL EXPOSURE RATING: [redacted]

NOTES & KEY ASSUMPTIONS:
Occupational exposure and environmental releases were estimated using the 9/30/2013 version of ChemSTEER tool. Input to ChemSTEER tool includes information from: the PMN submission, physical / chemical properties, and relevant past cases. This IRER assesses MFG, PROC, and USE. The PV is split between[redacted] uses. One PROC operation is assessed for each use; however, the submitter did not provide information for the use of each [redacted] type, therefore, it is assumed that they are all used similarly [redacted] and therefore only 1 USE is assessed for all [redacted] use types. // SAT concerns are for dermal, drinking water, and inhalation exposures. Migration to groundwater is slow. // The following different-submitter, similar-use past cases were referenced for consistency: [redacted] // MFG: This IRER assesses releases from storage tank cleaning, filter disposal, and equipment cleaning to water, landfill, [redacted] respectively. It also assesses dermal exposures [redacted] // PROC1: This IRER assesses releases from drum and equipment cleaning [redacted] It also assesses dermal exposures [redacted] // PROC2: This IRER assesses releases from drum and equipment cleaning to [redacted]. It also assesses dermal exposures [redacted] // PROC3: This IRER assesses releases from drum and equipment cleaning to [redacted] It also assesses dermal exposures [redacted] // PROC4: This IRER assesses releases from drum and equipment cleaning to [redacted]. It also assesses dermal exposures [redacted]. // USE: This IRER assesses releases from drum and equipment cleaning [redacted] and from [redacted] application to air or incineration and landfill [redacted] It also assesses dermal and inhalation exposures [redacted]

POLLUTION PREVENTION CONSIDERATIONS:
None.
EXPOSURE-BASED REVIEW: Yes (0 criteria met)
1) # of workers exposed:[redacted] >1000? No
2) >100 workers with >10 mg/day inhalation exposure: No
3) (a) >100 workers w/1-10 mg/day inh. exp. & >100 days/yr: No
   (b) Routine Dermal Cont: >250 workers & >100 days/yr: No

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MFG: [redacted]

Number of Sites/ Location: 1

Arrowstar, LLC Dalton GA 30720

Days/yr: 150

Basis: The submission specifies 1 site, 150 batches/year, [redacted], and 10,000 kg PMN/batch. RAD assumes 150 operating days.

Process Description: [redacted] (per submission, CRSS)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium.

Water
Output 2: [redacted]

to: POTW (Dalton Utilities; NPDES GA0047848) (per 3/7/18 and 5/10/18 amendments)

from: [redacted]
basis: User-Defined Loss Rate Model. A 5/10/18 amendment indicated that the [redacted] will be diluted and captured for reuse as raw material in future production. The remaining [redacted] will be sent to POTW (Dalton Utilities). The amendment estimates [redacted] per month. Note that the batch size specified in the submission was 10,000 kg; therefore, RAD assumes 0.01% release, 12 times per year.

Incineration or Landfill
Conservative: [redacted]

to: [redacted] (RAD assumes incineration) (per 5/10/18 amendment).

from: [redacted]
basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. 3/7/18 and 5/10/18amendments indicated that [redacted] The 5/10/18 amendment futher indicated that the [redacted] will be transferred [redacted] and not discharged to POTW. RAD assumes 1% release, once per year to incineration or landfill.

Landfill
Output 2: [redacted]

to: Landfill [redacted]

from: [redacted]
basis: User-Defined Loss Rate Model. [redacted]

RELEASE TOTAL
[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: [redacted]

Basis: The submission estimates up to [redacted] workers may be exposed. RAD assumes that all workers perform all activities and that all workers may be exposed at the highest potential exposures for each physical form, as conservative.

Inhalation:

negligible (VP < 0.001 torr); Mist generation not expected during this operation.

Dermal:

Exposure to Liquid at [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Loading Liquid Product into Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.

Exposure to Liquid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Sampling Liquid Product; EPA/OPPT 1-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.

INITIAL REVIEW ENGINEERING REPORT [redacted]

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PROC1: [redacted]

Number of Sites/ Location: 1

[redacted]

Days/yr: [redacted]

Basis: [redacted]

Process Description: [redacted] (per submission, CRSS)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per 3/7/18 amendment, the submitter provides information from customers stating that customers [redacted]. Due to the necessity of maintaining [redacted] Therefore, RAD assesses equipment cleaning once per year and does not asseses uncertain releases to water.

Incineration or Landfill
High End: [redacted]

to: [redacted]

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. The submission does not estimate releases for this operation. RAD assesses this release to uncertain media using the standard model as conservative (see Introductory Release Notes).

Incineration or Landfill
Conservative: [redacted]

to: [redacted]

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. The submission does not estimate releases for this operation. RAD assesses this release to uncertain media using the standard model as conservative (see Introductory Release Notes).

RELEASE TOTAL
[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY
Tot. # of workers exposed via assessed routes: [redacted]
Basis: The submission does not estimate exposures related to this operation. RAD assesses exposures at minimum default of [redacted] workers/site and that all workers perform all activities. RAD assumes that all workers may be exposed at the highest potential exposures for each physical form, as conservative.

Inhalation:

negligible (VP < 0.001 torr); mist generation not expected during this operation.

Dermal:

Exposure to Liquid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.

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PROC2: [redacted]

Number of Sites/ Location: [redacted]

[redacted]

Days/yr: [redacted]

Basis: [redacted].

Process Description: [redacted] (per submission, CRSS)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per 3/7/18 amendment, the submitter provides information from customers stating that customers [redacted] Therefore, RAD assesses equipment cleaning once per year and does not asseses uncertain releases to water.

Incineration or Landfill
High End: [redacted]

to: [redacted]

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. [redacted]. RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

Incineration or Landfill
Conservative: [redacted]

to: [redacted]

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. [redacted] RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

RELEASE TOTAL
[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY
Tot. # of workers exposed via assessed routes: [redacted]
Basis: The submission does not estimate exposures related to this operation. RAD assesses exposures at minimum default of [redacted] workers/site and that all workers perform all activities. RAD assumes that all workers may be exposed at the highest potential exposures for each physical form, as conservative.

Inhalation:

negligible (VP < 0.001 torr); mist generation not expected during this operation.

Dermal:

Exposure to Liquid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.

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PROC3: [redacted]

Number of Sites/ Location: [redacted]

[redacted]

Days/yr: [redacted]

Basis: [redacted]

Process Description: [redacted] (per submission, CRSS)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per 3/7/18 amendment, the submitter provides information from customers stating that [redacted] Therefore, RAD assesses equipment cleaning once per year and does not asseses uncertain releases to water.

Incineration or Landfill
High End: [redacted]

to: [redacted]

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. [redacted] RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

Incineration or Landfill
Conservative: [redacted]

to: [redacted]

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. [redacted] RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

RELEASE TOTAL
[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY
Tot. # of workers exposed via assessed routes: [redacted]
Basis: The submission does not estimate exposures related to this operation. RAD assesses exposures at minimum default of [redacted] workers/site and that all workers perform all activities. RAD assumes that all workers may be exposed at the highest potential exposures for each physical form, as conservative.

Inhalation:

negligible (VP < 0.001 torr); mist generation not expected during this operation.

Dermal:

Exposure to Liquid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.

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PROC4: [redacted]

Number of Sites/ Location: [redacted]

[redacted]

Days/yr: [redacted]

Basis: [redacted]

Process Description: [redacted]
(per submission, CRSS)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per 3/7/18 amendment, the submitter provides information from customers stating [redacted]
Therefore, RAD assesses equipment cleaning once per year and does not asseses uncertain releases to water.

Incineration or Landfill
High End: [redacted]

to: [redacted]

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. The submission does not estimate releases for this operation. RAD assesses this release to uncertain media using the standard model as conservative (see Introductory Release Notes).

Incineration or Landfill
Conservative: [redacted]

to: [redacted]

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. [redacted]. RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

RELEASE TOTAL
[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY
Tot. # of workers exposed via assessed routes: [redacted]
Basis: The submission does not estimate exposures related to this operation. RAD assesses exposures at minimum default of [redacted] workers/site and that all workers perform all activities. RAD assumes that all workers may be exposed at the highest potential exposures for each physical form, as conservative.

Inhalation:

negligible (VP < 0.001 torr); mist generation not expected during this operation.

Dermal:

Exposure to Liquid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.

INITIAL REVIEW ENGINEERING REPORT [redacted]

PMN: 18-0070

USE1: [redacted]

Number of Sites/ Location: [redacted]

[redacted]

Days/yr: [redacted]

Basis: [redacted]

Process Description: [redacted] (per CRSS, Submission, 3/7/18 amendment)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per 3/7/18 amendment Insulation contractors must clean out the application equipment with solvents such as acetone-this requires the cleaning solvent to be disposed of as hazardous waste which may contain minute amounts of unreacted PMN, this material will not reach POTWs or water. Therefore RAD does not assess releases to water.

Air
Typical: [redacted]

Worst Case: [redacted]

to: Air and Incineration or Landfill (per model)

from: [redacted]

basis: EPA/OPPT Automobile Refinish Coating Overspray Loss Model (non-volatiles). [redacted] RAD assesses this release to Air and Incineration or Landfill using the standard model as conservative.

Incineration or Landfill
High End: [redacted]

to: [redacted]

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. [redacted] RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

Incineration or Landfill
Conservative: [redacted]

to: [redacted]

from: Equipment Cleaning Losses of Liquids from a Single, Large Vessel

basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual. [redacted] RAD assesses this release [redacted] using the standard model as conservative (see Introductory Release Notes).

Incineration or Landfill
Typical: [redacted]

Worst Case: [redacted]

to: Air and Incineration or Landfill (per model)

from: [redacted]

basis: EPA/OPPT Automobile Refinish Coating Overspray Loss Model (non-volatiles). [redacted] RAD assesses this release to Air and Incineration or Landfill using the standard model as conservative.

RELEASE TOTAL

[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY
Tot. # of workers exposed via assessed routes: [redacted]
Basis: RAD assesses exposures at minimum default of [redacted] workers/site and that all workers perform all activities. RAD assumes that all workers may be exposed at the highest potential exposures for each physical form, as conservative.

Inhalation:

Exposure to Particulate (non-volatile) (Class I)
Upper Bound:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with inhalation exposure: [redacted]
Basis: [redacted]
Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.
Concentration: Cm = 7.5 mg/m3; exposure duration: h = 8 hr/day

NOTE: The respirator class is: I. Particulate (including solid or liquid droplets).

INHALATION MONITORING DATA REVIEW

1)	Uncertainty (estimate based on model, regulatory limit, or data not specific to industry):	Yes
2)a)	Exposure level > 1 mg/day?	Yes
	OR	
b)	Hazard Rating for health of 2 or greater? 2	Yes

=> Inhalation Monitoring Data Desired? **No**

Dermal:

Exposure to Solid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years. |

INITIAL REVIEW ENGINEERING REPORT [redacted]

PMN: 18-0070

USE 2: [redacted]

Number of Sites/ Location: [redacted]

[redacted]

Days/yr: [redacted]

Basis: [redacted]

Process Description: [redacted] (per CRSS, Submission, 1991 Foam Blowing GS)

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per 3/7/18 amendment, application equipment [redacted] Therefore RAD does not assess releases to water.

Incineration or Landfill
High End: [redacted]

to: [redacted]

from: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material

basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual. [redacted] RAD assumes 3% release, likely sent to incineration or landfill (see Introductory Release Notes).

Incineration or Landfill
Output 1: [redacted]

Output 2: [redacted]

to: [redacted]

from: Equipment Cleaning

basis: User-Defined Loss Rate Model. Per March 2015 guidance on assessing [redacted] RAD assumes 3% release, likely sent to incineration or landfill (see Introductory Release Notes).

RELEASE TOTAL
[redacted]

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY
Tot. # of workers exposed via assessed routes: [redacted]
Basis: RAD asssess a default minimum of [redacted] workers/site.

Inhalation:

negligible (VP < 0.001 torr). The 1991 Foam Blowing GS indicaates the use of standard models to estimate inhalation exposures.

Dermal:

Exposure to Liquid [redacted]
High End:
> Potential Dose Rate: [redacted]
> Lifetime Average Daily Dose: [redacted]
> Average Daily Dose: [redacted]
> Acute Potential Dose: [redacted]
Number of workers (all sites) with dermal exposure: [redacted]
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years.